

IMPACT OF EMISSIONS FROM ALUMINUM ELECTROLYSIS PLANTS ON AMBIENT AIR POLLUTION AND PREGNANCY OUTCOMES AND NEWBORN'S HEALTH

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Background and Aims: We studied two aluminum-producing plants located in the cities of Kamensk-Uralskiy and Krasnoturyinsk (Middle Urals) emitting pollutants creating multicomponent environmental contamination. The change from Soderberg to prebaked anodes implemented early this century for some of the electrolyzers in Kamensk-Uralskiy has allowed total atmospheric emissions to be reduced 3.5 times. The purpose of our study was investigated the possible adverse effects of ambient air pollution on pregnancy and birth outcomes, exposed to such pollution in these towns.

Methods: We studied ambient air pollution with fluorides, benzo(a)pyrene, alkali and sulfur dioxide during the warm and cold seasons of 2004 at a distance of up to 3 kilometers from the aluminum plants. Information on the health status of pregnant woman and newborn dwelling in the same areas was obtained from official medical documentation for the same period. The association of health with ambient air pollution was analyzed using linear multiple regression models.

Results: The maximum daily average concentrations in Krasnoturyinsk and Kamensk-Uralskiy were (in mg/m³) respectively, 0.0166-0.0806 and 0.008867-0.0433 for HF, 0.024-0.124 and 0.014-0.064 for low soluble fluorides, 0.000011-0.00005 and 0.000013-0.000067 for benzo(a)pyrene, 0.0144-0.0622 and 0.0047-0.0152 for NaOH, 0.075-0.125 and 0.01-0.0425 for SO₂.

There was not found any association of the pregnant women's health outcomes with ambient air pollution. The incidence of illness in newborn was higher in Krasnoturyinsk than in Kamensk-Uralskiy, including intrauterine growth retardation (IUGR), 128,0‰ vs. 37,0‰ and low birth weight (LBW; < 2,500 g) - 70,0‰ vs. 42,0‰, respectively. IUGR was associated with concentrations of low soluble fluorides (B=176.423±60.445) and SO₂ (B=194.015±46.297), and also LBW with benzo(a)pyrene (B=8582.681±2478.736) and NaOH (B=11.860±4.605).

Conclusions: Industrial emissions from aluminum electrolysis plants contaminate the environment of adjoining residential areas (particularly where the use of Soderberg anodes continues) demonstrating association with considerable impairment to newborn's health.